600V, 7A, Trench FS II Fast IGBT

General Description:

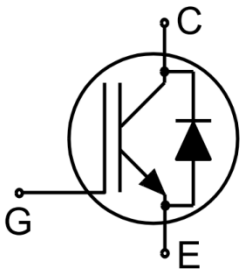
Using NCE's proprietary trench design and advanced FS (Field Stop) second generation technology, the 600V Trench FSII IGBT offers superior conduction and switching performances, and easy parallel operation;

Features

- Trench FSII Technology Offering
- Very low $V_{CE(sat)}$
- High speed switching
- Positive temperature coefficient in $V_{CE(sat)}$
- Very tight parameter distribution
- High ruggedness, temperature stable behavior

Application

- Air Condition
- Inverters
- Motor drives



Schematic diagram

Package Marking and Ordering Information

Device	Device Package	Device Marking
NCE07TD60B	TO-220	NCE07TD60B

TO-220

Absolute Maximum Ratings (T_C=25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate- Emitter Voltage	±30	V
I_C	Collector Current	14	A
	Collector Current @T_C = 100 °C	7	A
I_{Cplus}	Pulsed Collector Current, t_p limited by T_{jmax}	21	A
-	turn off safe operating area, V_{CE}=600V, T_J=150°C	21	A
I_F	Diode Continuous Forward Current @T_C = 100 °C	7	A
I_{FM}	Diode Maximum Forward Current	21	A
P_D	Power Dissipation @ T_C = 25°C	73	W
	Power Dissipation @T_C = 100 °C	36.5	W
T_J,T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	°C
T_L	Maximum Temperature for Soldering	260	°C
t_{sc}	Short circuit withstand time V_{GE}=15V, V_{CC}≤400V, Allowed number of short circuits<1000Time between short circuits:≥1.0s,T_j≤150°C	5	us

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Thermal Characteristic

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	2.05	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	2.50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62	°C/W

Electrical Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions		Value			Units
				Min.	Typ.	Max.	
Static Characteristics							
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V,I_{CE}=1mA		600	--	--	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} =0V,V_{CE}=600V		--	--	4	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE}=+30V,V_{CE}=0V		--	--	100	nA
$I_{GES(R)}$	Gate to Source Reverse Leakage	V_{GE}=-30V,V_{CE} =0V		--	--	100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=5A	Tj=25°C	--	1.7	1.9	V
		V_{GE}=15V	Tj=100°C	--	1.9	--	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1mA,V_{CE}=V_{GE}		4.0	5.0	6.0	V
Dynamic Characteristics							
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz		--	675	--	pF
C_{oes}	Output Capacitance			--	22	--	
C_{res}	Reverse Transfer Capacitance			--	13	--	
Q_g	Total Gate Charge	V_{CC}=480V, I_C=7A, V_{GE}=15V		--	28	--	nC
Q_{ge}	Gate to Emitter Charge			--	8	--	
Q_{gc}	Gate to Collector Charge			--	13	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits Time between short circuits: ≥1.0s	V_{GE}=15V,V_{CC}≤400V, t_{SC}≤5us,Tj≤150°C		--	34	--	A
Switching Characteristics							
$t_{d(ON)}$	Turn-on Delay Time	V_{CC}=400V,I_C=7A, V_{GE}=0/15V, R_g=5Ω Inductive Load		--	20	--	ns
t_r	Rise Time			--	15	--	
$t_{d(OFF)}$	Turn-Off Delay Time			--	73	--	
t_f	Fall Time			--	18	--	
E_{on}	Turn-On Switching Loss			--	0.21	--	mJ
E_{off}	Turn-Off Switching Loss			--	0.10	--	
E_{ts}	Total Switching Loss			--	0.31	--	

Electrical Characteristics of the Diode(T_C= 25°C unless otherwise specified)：

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{FM}	Diode Forward Voltage	I_F=7A	--	1.5	1.7	V
T_{rr}	Reverse Recovery Time	I_F=7A, di/dt=200A/us	--	230	--	ns
I_{RRM}	Diode Peak Reverse Recovery Current		--	3.5	--	A
Q_{rr}	Reverse Recovery Charge		--	0.44	--	uC
Pulse width t_{tp}≤380μs,δ≤2%						

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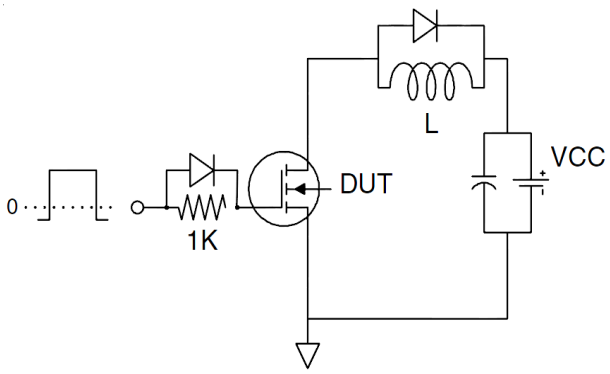
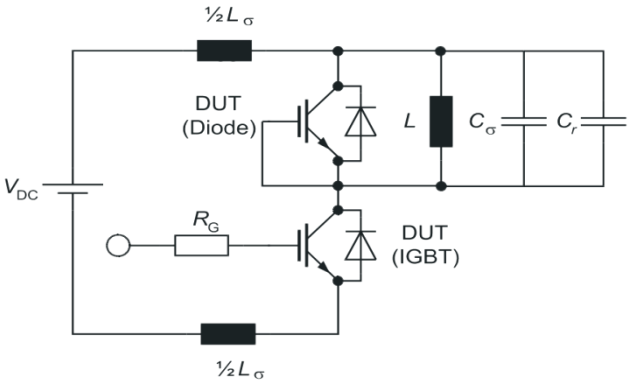
Test Circuit

1) Gate Charge Test Circuit

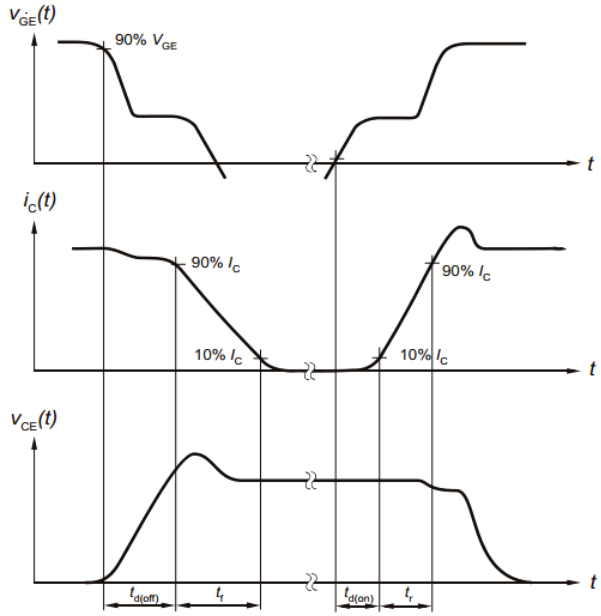


2) Switch Time Test Circuit

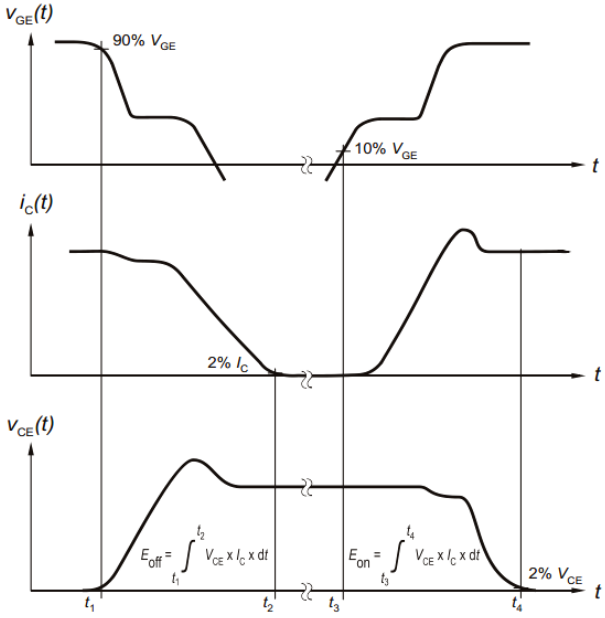


Switching characteristics

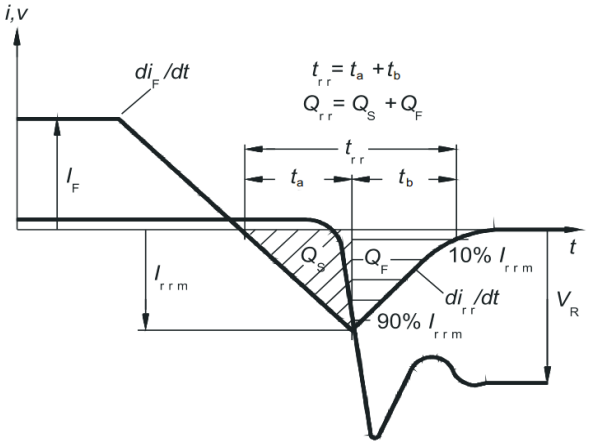
1) Definition of switching times



2) Definition of switching losses



3) Definition of diode switching characteristics



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Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

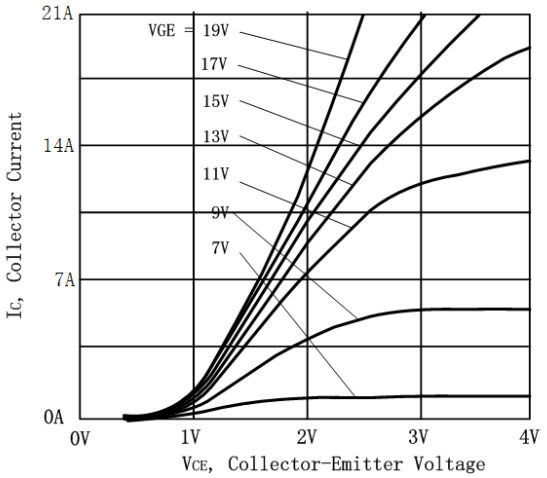


Figure 2 Transfer Characteristics

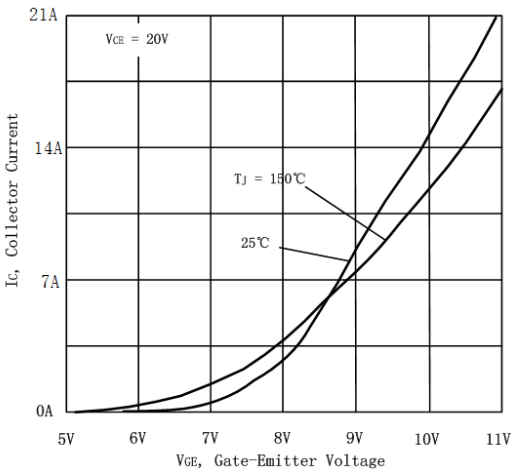


Figure 3 V_{CEsat} vs. Case Temperature

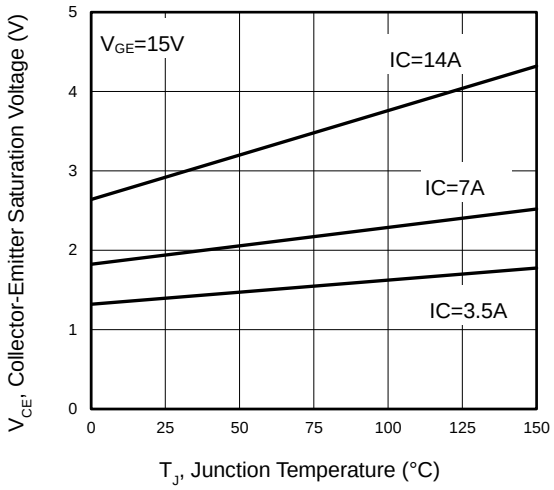


Figure 4 Saturation Voltage vs. V_{GE}

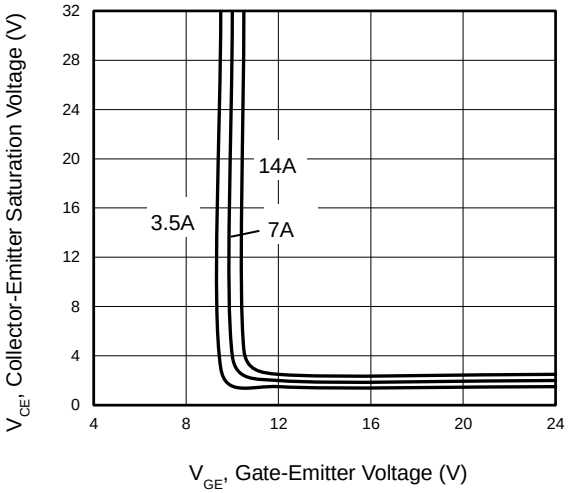


Figure 5 Capacitance Characteristics

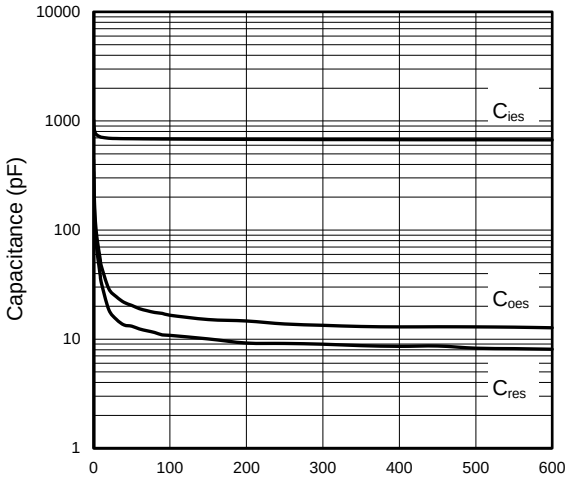
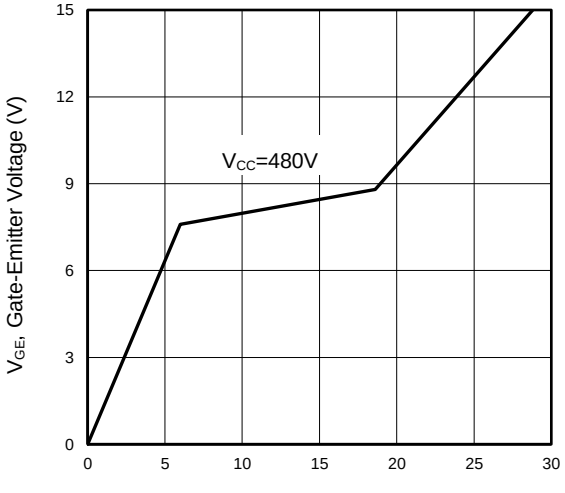


Figure 6 Gate charge waveform



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Typical Electrical and Thermal Characteristics

Figure 7 Forward Characteristics

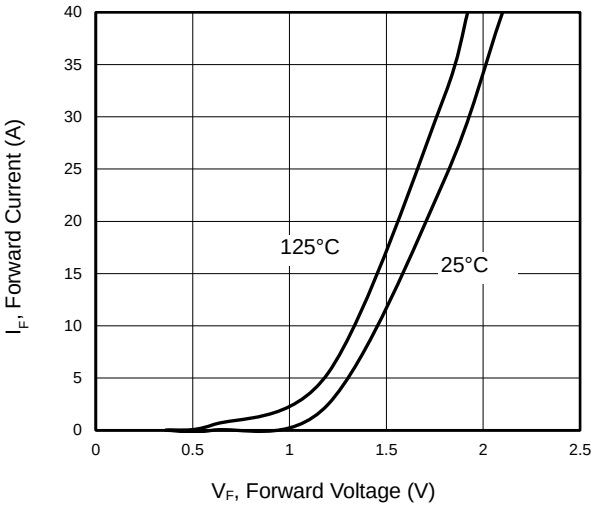


Figure 8 V_F vs. Temperature

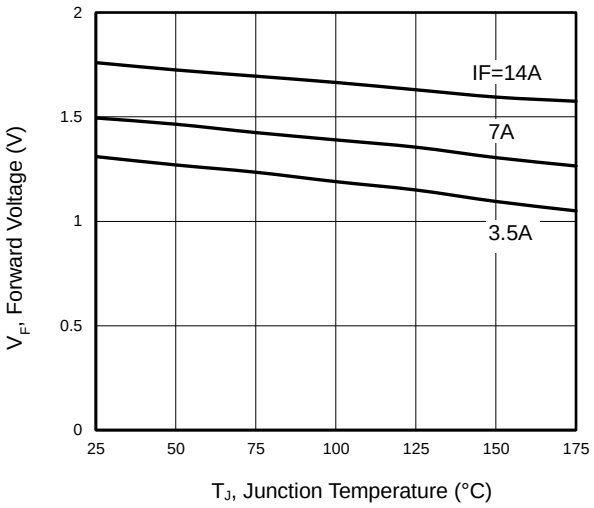


Figure 9 Typical Switching Times as a Function of Gate Resistor

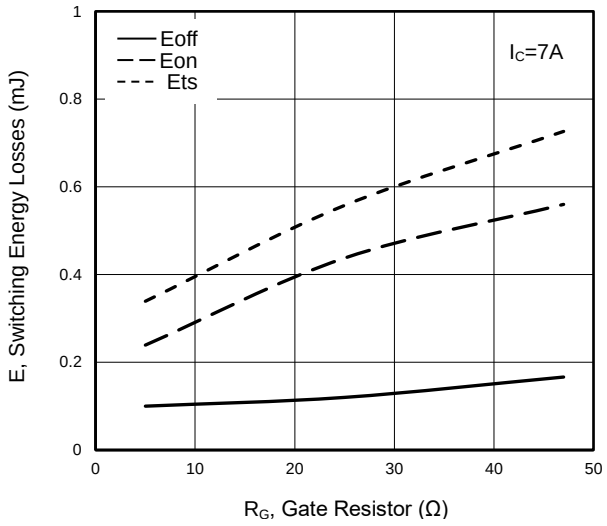


Figure 10 Typical Switching Times as a Function of Junction Temperature

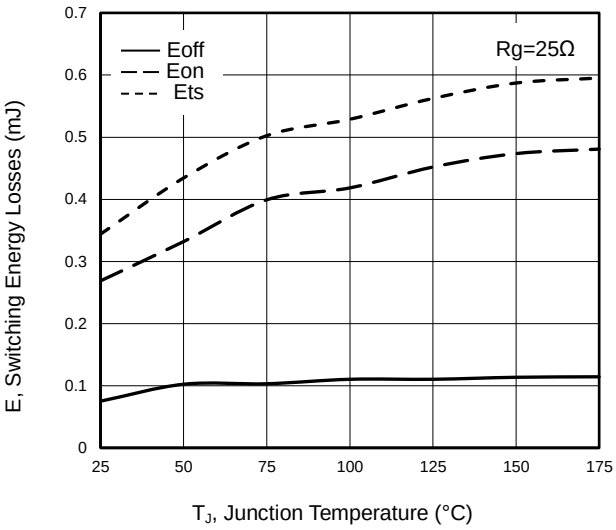


Figure 11 Gate-emitter Threshold Voltage as a Function of Junction Temperature

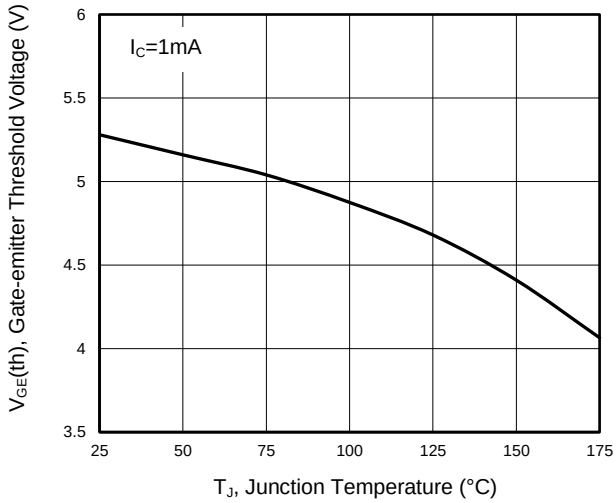
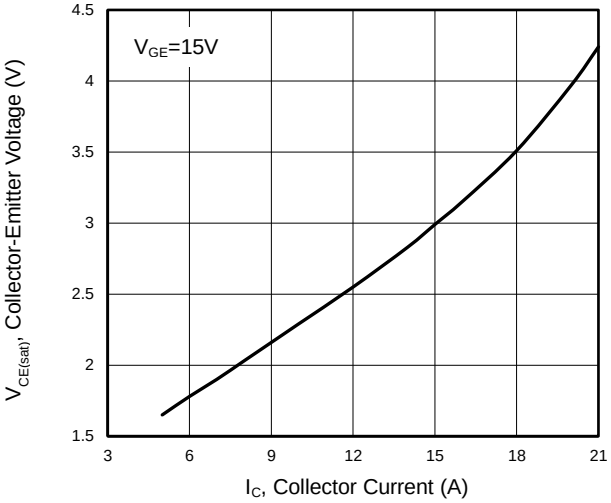


Figure 12 Typical Collector-emitter Saturation Voltage as a function of Collector Current



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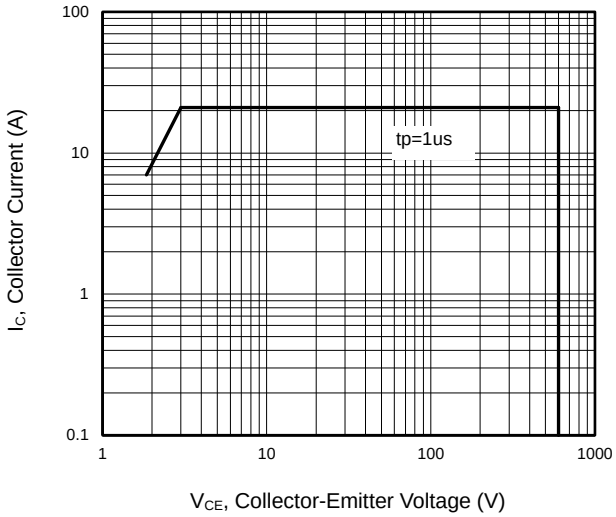
Typical Electrical and Thermal Characteristics

Figure 13 Forward Bias Safe Operating Area



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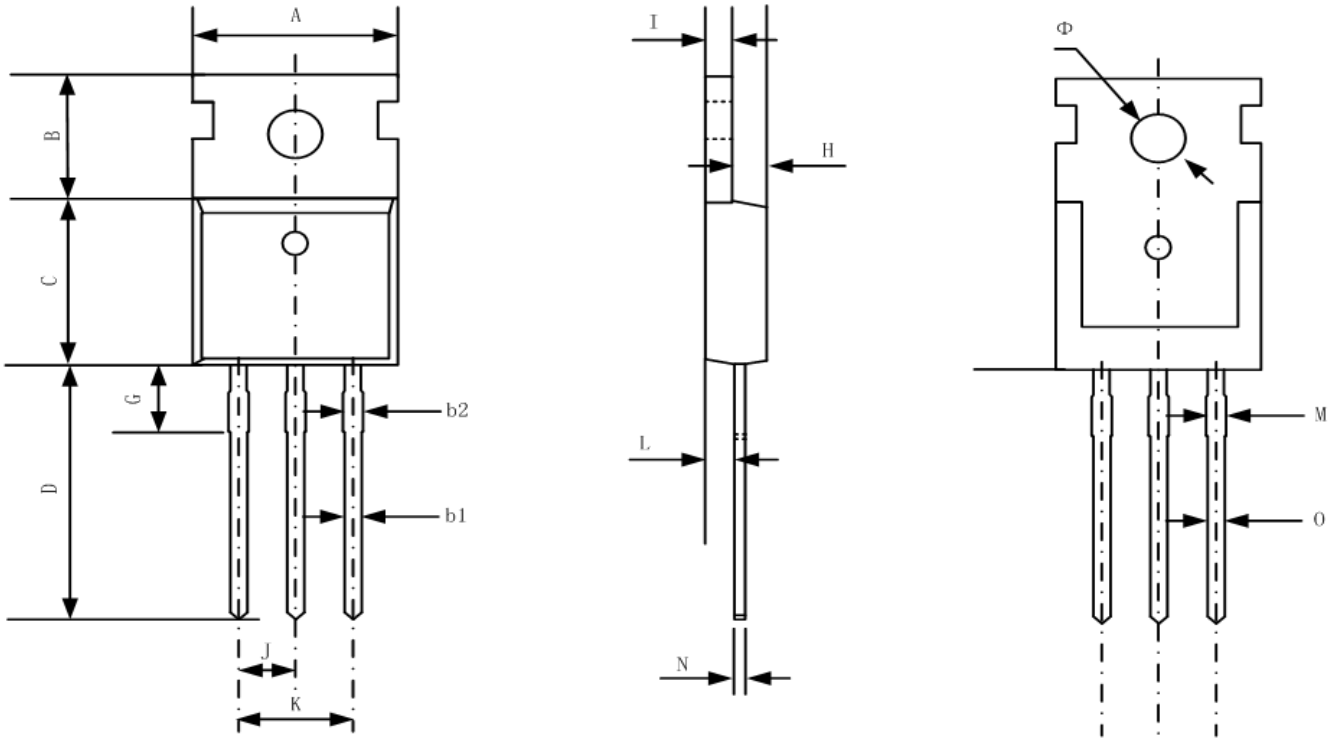
TO-220-3L-C Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	9.70	10.20	0.38	0.40
B	6.30	6.70	0.25	0.26
C	9.00	9.47	0.35	0.37
D	12.78	13.38	0.50	0.53
G	2.65 REF		0.104 REF	
H	3.00	3.40	0.12	0.13
I	1.25	1.40	0.05	0.06
J	2.40	2.70	0.09	0.11
K	5.00	5.15	0.20	0.20
L	2.20	2.60	0.09	0.10
M	1.25	1.45	0.05	0.06
N	0.45	0.60	0.02	0.02
O	0.70	0.90	0.03	0.04
Φ	3.6 REF		0.142 REF	

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